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Review of the production of eight indicators from the revised Guidelines for the Application of Environmental Indicators in Eastern Europe, Caucasus and Central Asia

Analysis on the production and sharing of United Nations Economic Commission for Europe core environmental indicators by countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

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I. Introduction

1. The Joint Task Force on Environmental Indicators agreed at its seventh session (Geneva, 5-7 November 2013) to review in detail the production and sharing of a set of what the Group considers the United Nations Economic Commission for Europe (ECE) core environmental indicators from the revised Guidelines for the Application of Environmental Indicators in Eastern Europe, Caucasus and Central Asia (Indicator Guidelines).

2. The Joint Task Force requested that the review be supported by an analytical paper prepared by the secretariat and presenting the status and analysis of production and sharing of each of the core indicators in each of the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia (target countries).

3. The Joint Task Force further requested that the paper be based on the information available on national websites or on additional information and explanations sent by the target countries.

4. This paper contains the analysis requested by the Joint Task Force. It is structured into two main parts. Part one – production of environmental indicators – presents the analysis of countries' performance in producing the indicators vis-à-vis the methodologies stipulated in the Indicator Guidelines. Part two – online sharing of environmental indicators – analyses the information on the indicators as published on the national websites vis-à-vis what is considered a clear and informative online presentation of information. The paper closes with general conclusions.

II. Production of eight core indicators

5. For this review of the production of the core indicators the national submissions, being either links to the websites of relevant agencies where indicators are published or tables filled with necessary data, are analysed.

6. The analysis is made against what is considered an optimal level of production for each of the eight core indicators with regard to data structure and format and the availability of the necessary time series. The data structure, format and times series are applied as specified by the Indicator Guidelines.

7. The optimal level of structure is reached when all parameters that were selected for this exercise of core indicators are correctly used to produce the required datasets and sub-indicators (see Annex I). The optimal level of format is reached, if all datasets for the respective indicator are provided in the required unit of measurement. In terms of the time series the optimal level is reached, if the data are provided for the years 1990, 1995, and 2000-2012.

8. The review of production for each indicator is provided in chapters A-H.

9. Furthermore, the following categories are used for the evaluation of the structure and the format of indicator production:

(a) Fully met – the provided data fully or almost fully meet the requirements specified by the Indicator Guidelines;

(b) Partially met – the provided data do not fully meet the requirements of the Indicator Guidelines;

(c) Not met - the provided data do not meet the requirements of the Indicator Guidelines, or they cannot be found following the provided links;

(d) No data – data have not been provided.

10. The analysis should help each country to understand its gaps with regard to the optimal level of production of the indicators and allow identifying concrete steps to reach such an optimal level.

A Emission of pollutants into the atmospheric air (A1)

11. This core indicator provides a measure of the pressure on environment in terms of total emissions of harmful substances into the atmospheric air from stationary and mobile sources, which are regulated in the Protocols of the ECE Convention on Long-range Transboundary Air Pollution.

12. The current analysis considers data on sulphur dioxide (SO_2) emission per capita (sub-indicator 1.1) and per unit of country area (km^2) (sub-indicator 1.2), as well as nitrogen oxides (NO_X) emissions per capita (sub-indicator 1.3) and per unit of country area (km^2) (sub-indicator 1.4).

1. Optimal level of indicator production

Structure

13. For the purposes of optimal production of the indicator A1, calculation of total volume of pollutant emissions should include emission data from stationary and mobile sources for the following air pollutants:

(a) Sulphur dioxide (SO_2),

(b) Nitrogen oxides (NO_X), shown as nitrogen dioxide (NO_2)

14. For the purposes of calculation of sub-indicators 1.1, 1.2, 1.3, 1.4, the following parameters are to be used:

(a) Population of a country;

(b) Area of a country.

15. This analysis considers only some parameters of the indicator A1, in accordance with the requirements of the project on establishing a joint system of environmental indicators, in order to set up a regular process of reporting on those indicators. The full set of parameters is specified in the Indicator Guidelines (http://www.unece.org/env/indicators.html).

Format

16. Harmful substances: the parameters are given in thousands of tons, tons, or kilograms of the respective harmful substance; area of a country – in km^2; population – in millions of people.

Time series

17. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Table 1
Production of indicator A1 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Fully met (stationary and mobile sources)	Fully met	1990; 1995; 2000-2012
Azerbaijan	Partially met (stationary and mobile sources)	Fully met	1995; 2000-2012
Belarus	Partially met (stationary and mobile sources)	Partially met	1995; 2000-2013
Bosnia and Herzegovina	No data		
Georgia	Fully met (stationary and mobile sources)	Fully met	2000-2012
Kazakhstan	Fully met (stationary sources)	Fully met	1990; 1995; 2000-2012
Kyrgyzstan	Fully met (stationary sources)	Fully met	2006-2011
Montenegro	Partially met (stationary and mobile sources)	Partially met	1990-2010
Republic of Moldova	Partially met (stationary and mobile sources)	Partially met	2006-2012
Russian Federation	Fully met (stationary and mobile sources)	Fully met	2000-2012
Serbia	Fully met (stationary and mobile sources)	Fully met	1990; 1995; 2000-2012
Tajikistan	No data		
Former Yugoslav Republic of Macedonia	Fully met (stationary sources)	Fully met	1990; 1995; 2000-2012
Turkmenistan	No data		
Ukraine	Partially met (stationary and mobile sources)	Partially met	1990-2012
Uzbekistan	No data		

Structure

18. Armenia, Georgia, the Russian Federation, Serbia and The former Yugoslav Republic of Macedonia have provided data which fully meet the requirements of the Indicator Guidelines. They have provided the total of emissions, distinguishing stationary and mobile sources, as well as values for SO_2 and NO_X emissions from stationary and mobile sources per capita and per country area. At the same time, The former Yugoslav Republic of Macedonia does not distinguish between stationary and mobile sources for the period of 2001-2007.

19. Azerbaijan has submitted NO_X emission data both for stationary and mobile sources and SO_2 emission data for stationary sources only. The NO_X emission data for stationary and mobile sources per capita and per country area were also presented. At the same time, there are no SO_2 emission data per capita and per country area, however, such data for stationary sources were provided.

20. Kyrgyzstan's data contain all parameters for emissions from stationary sources. Moreover, there are NO_X and SO_2 emission data available for mobile sources.

21. Kazakhstan has calculated all four sub-indicators, however only for emissions from stationary sources.

22. Belarus has submitted total data of SO_2 and NO_2 emissions, as well as data of such emissions separately for stationary and mobile sources. The emission data per capita are not broken down per substance and calculated per person living in cities where sources of emissions exist (totally 19 cities).

23. Republic of Moldova and Ukraine provided data of SO_2 and NO_X emissions from stationary and mobile sources, but they have not presented these data per capita and per country area.

24. Montenegro does not provide data on SO_2 and NO_X per country area and capita. Furthermore it is not specified if data on emission are from mobile or stationary sources. However, for 2010 data are broken down by sectors (e.g. energy production and distribution, road transport, etc.).

25. Tajikistan, Turkmenistan and Uzbekistan have not provided data on this indicator.

Format

26. All countries, which submitted the data, measure the indicators in units according to the required data format. However, Belarus does not have emission data per country area (km^2), and Montenegro, Republic of Moldova and Ukraine have not presented the emission data per capita (kg/capita) and per country area (km^2).

Time series

27. The most complete time series of data on the emission of air pollutants have been submitted by Kazakhstan, Serbia, The former Yugoslav Republic of Macedonia (period of 1990, 1995, 2000-2012), Ukraine (period of 1990-2012), Montenegro (period of 1990-2010), Azerbaijan (period of 1995-2012), Georgia and the Russian Federation (period of 2000-2012). Belarus has presented the data on emissions per capita in cities for the period of 1995, 2000-2013, and general emissions for the period of 2005-2012. Armenia, Kyrgyzstan and Republic of Moldova presented emissions from the middle of the 2000s and now have data series for 6-7 years.

B Ambient air quality in urban areas (A2)

28. This core indicator is an indicator of the state of environment and on impact of air pollution on the population.

29. The analysis shows the annual mean concentration of nitrogen dioxide in urban areas (sub-indicator 2.1).

1. Optimal level of indicator production

Structure

30. For the purposes of optimal production of indicator A2, concentrations of nitrogen dioxide (NO_2) in urban areas are to be measured. The minimal requirement: average annual concentration of NO_x in the capital city.

31. This analysis considers only some parameters of the indicator A2, in accordance with the requirements of the project on establishing a joint system of environmental indicators, in order to set up a regular process of reporting on those indicators. The full set of parameters is specified in the Indicator Guidelines (http://www.unece.org/env/indicators.html).

Format

32. For this indicator the following units of measurement are to be used: concentration of harmful substance in micrograms (μg) per m^3 of ambient air.

Time series

33. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia.

Table 2
Production of indicator A2 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Fully met (1 city)	Fully met	1990; 1995; 2000-2012
Azerbaijan	Fully met (1 city)	Fully met	1995; 2000-2012
Belarus	Fully met (12 cities)	Fully met	2005-2012
Bosnia and Herzegovina	Fully met (3 cities)	Fully met	2003-2012
Georgia	Fully met (1 city)	Fully met	1995; 2000; 2006-2012
Kazakhstan	Fully met (1 city)	Fully met	2000-2013
Kyrgyzstan	Fully met (1 city)	Fully met	2006-2011
Montenegro	Fully met (2 cities)	Fully met	2009-2012

Country	*Structure*	*Format*	*Time series*
Republic of Moldova	Fully met (3 cities)	Fully met	2005-2012
The Russian Federation	Partially met	Partially met	2011
Serbia	Fully met (3 cities)	Fully met	1990; 1995; 2000-2012
Tajikistan	No data		
Former Yugoslav Republic of Macedonia	Fully met (3 cities)	Fully met	2004-2011
Turkmenistan	No data		
Ukraine	No data		
Uzbekistan	No data		

Structure

34. The following countries have submitted data which fully meet the requirements of the Indicator Guidelines: Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova and Serbia.

35. Belarus has shown the average annual concentration of nitrogen dioxide in 12 cities, Kyrgyzstan in 5 cities, Bosnia and Herzegovina, Republic of Moldova, and Serbia in three cities, Montenegro in two cities, and Azerbaijan, Georgia and Kazakhstan in one city.

36. For the Russian Federation data on average annual concentration of nitrogen dioxide in the most polluted cities are shown not in absolute values, but in comparison with the set standard of Maximum Permissible Concentration (MPC) and expressed in terms of exceeding these standards (for example, 2 MPC).

37. Tajikistan, Ukraine and Uzbekistan have not submitted data on this indicator.

Format

38. All countries, which submitted the data (except the Russian Federation), measure the indicators in units according to the data submission format (nitrogen dioxide – in micrograms per 1 m$_3$ of air). The Russian Federation has shown measurement units multiple of MPC (Maximum Permissible Concentration).

Time series

39. The longest time series of indicator data have been submitted by Armenia, Azerbaijan and Serbia (period of 1995; 2000-2012), as well as by Kazakhstan (2000-2013). Bosnia and Herzegovina has shown data for the period of 2003-2012, Belarus and Republic of Moldova for 2005-2012, The former Yugoslav Republic of Macedonia for 2004-2011, Kyrgyzstan for 2006-2011, and Montenegro for 2009-2012. In Georgia within the period of 2000-2006 there were no measurements of nitrogen dioxide concentrations.

40. The Russian Federation, which submitted data only for 2011, publishes an annual review of air quality and pollution in the country, however, those reviews do not include long time data series.

C Consumption of ozone-depleting substances (A3)

41. This core indicator is an indicator of environmental pressure. It shows the amount of ozone-depleting substances (ODS), consumed in the country and regulated by the Vienna Convention for the Protection of the Ozone Layer, its Montreal Protocol on Substances that Deplete the Ozone Layer as well as by Montreal Protocol Amendments enacted in London, Copenhagen, Beijing and Montreal.

42. The total consumption of ODS is defined as the production of ODS plus imports minus exports of ODS (sub-indicator 3.1).

1. Optimal level of indicator production

Structure

43. For the purposes of optimal production of indicator A3, calculation of ODS consumption should include the amount of ODS consumed in the country, which comprises the total consumption of chlorofluorocarbons (CFCs), halons, carbon tetrachloride, 1,1,1-trichloroethane (methyl chloroform) hydrochlorofluorocarbons (HCFCs), and methyl bromide.

Format

44. For this indicator the following units of measurement are used: tons of ODS weighted by their ozone depleting potential (ODP).

Time series

45. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Table 3
Production of indicator A3 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Fully met	Fully met	1995; 2000-2012
Azerbaijan	Fully met	Fully met	1990; 2006-2011
Belarus	Fully met	Fully met	2009-2012
Bosnia and Herzegovina	Fully met	Fully met	1990; 1995; 2000-2012
Georgia	Fully met	Fully met	1995; 2000-2012
Kazakhstan	Fully met	Fully met	1990; 1995; 2000 -2012
Kyrgyzstan	Fully met	Fully met	2005-2011
Montenegro	Fully met	Fully met	1995; 2000; 2004-2012
Republic of Moldova	Fully met	Fully met	1990-2012

Country	*Structure*	*Format*	*Time series*
The Russian Federation	Partially met	Partially met	2010-2012
Serbia	Fully met	Fully met	1995; 2000-2012
Tajikistan	No data		
Former Yugoslav Republic of Macedonia	Fully met	Fully met	1995; 2000-2012
Turkmenistan	No data		
Ukraine	No data		
Uzbekistan	No data		

Structure

46. Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Serbia and The former Yugoslav Republic of Macedonia have submitted data which fully meet the requirements of the Indicator Guidelines.

47. Kazakhstan provided data for CFCs, HCFCs, methylbromide and brominechloromethane. Georgia and Kyrgyzstan provided data for different CFCs, HCFCs, as well as methylbromide. Montenegro has submitted data on CFCs, tetrachloromethane and HCFCs consumption. At the same time Republic of Moldova provided data of CFCs consumption only. Armenia ha lata on the consumption of CFCs-12 and HCFC-22, but there are no data of other ODS. Azerbaijan's data show that there were no measurements of ODS consumption in 1995 and 2000-2005.

48. Belarus provided only data on total HCFCs without further specifications.

49. The Russian Federation has shown data of production, export and import of ODS, what cannot be taken as their consumption.

50. Tajikistan, Turkmenistan, Ukraine and Uzbekistan have not submitted data for this indicator.

Format

51. The majority of countries, which submitted the data, measure the indicators in units according to the required data format. The Russian Federation has submitted data of production, export and import of ODS in metric tons.

Time series

52. The longest time series of indicator data have been submitted by Bosnia and Herzegovina and Kazakhstan (1990, 1995 and 2000-2012). Armenia, Serbia, The former Yugoslav Republic of Macedonia, Republic of Moldova provided data for 1995; 2000-2012, Montenegro for 1995; 2000; 2004-2012, Kyrgyzstan for 2005-2011, Bosnia and Herzegovina for 2008-2012, Belarus for 2009-2012 and the Russian Federation for 2010-2012.

53. Data of ODS consumption for the majority of the analysed countries within the period of 1990-2013 are available on the web-site of the Vienna Convention for the Protection of the Ozone Layer (http://ozone.unep.org/new_site/en/ozone_data_tools_access.php).

D Greenhouse gas emissions (B3)

54. This core indicator is a measure of anthropogenic emissions of greenhouse gases (GHGs) included in Annex A to the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC).

55. The indicator should show the total emissions of GHGs as well as per capita (sub-indicator 4.1) and per level of GDP (sub-indicator 4.2).

1. Optimal level of indicator production

Structure

56. To reach the optimal level of the production of indicator B3, the following parameters need to be included in the calculation of the total GHG emissions: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6), emissions/removals by sources and sinks through land use, land use change and forestry (LULUCF).

57. In addition, for the determination of the Sub-indicators 4.1 and 4.2 the following parameters should be included:

(a) Population of the country

(b) GDP

Format

58. The following units of measurement need to be applied:

(a) GHGs: parameters presented in tones of CO2 equivalent or millions of tons of CO2 equivalent;

(b) Population: presented in million people;

(c) GDP: presented in international dollars (PPP);

(d) Emissions per level of GDP: in tones of CO2 equivalent / 1000 dollars.

Time series

59. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Table 4
Production of indicator B3 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Fully met	Fully met	1990; 1995; 2000-2006
Azerbaijan	Fully met	Fully met	1990; 1995; 2000-2012
Belarus	Partially met	Partially met	2005-2011

Country	*Structure*	*Format*	*Time series*
Bosnia and Herzegovina	Fully met	Fully met	1990-2001
Georgia	Fully met	Fully met	1990; 1995; 2000-2011
Kazakhstan	Fully met	Fully met	1990; 1995; 2000 -2011
Kyrgyzstan	Fully met	Fully met	2000-2005
Montenegro	Fully met	Fully met	1990-2010
Republic of Moldova	Not met	Not met	1990-2010
The Russian Federation	Fully met	Fully met	1990; 2000; 2005; 2007-2011
Serbia	Partially met	Fully met	1990, 1998
Tajikistan	No data		
Former Yugoslav Republic of Macedonia	Fully met	Fully met	1990; 1995; 2000-2009
Turkmenistan	No data		
Ukraine	Partially met	Partially met	2004-2012
Uzbekistan	No data		

Structure

60. Kazakhstan's data fully met the requirements of the Indicator Guidelines. The data contains all required parameters (CO_2, N_2O, CH_4, HFC, PFC, SF_6, LULUCF).

61. The Russian Federation has emission data on all greenhouse gases, provided for each gas and as an equivalent of CO_2. Complete data, as total emissions of CO_2, N_2O, CH_4, LULUCF have been submitted by Azerbaijan, Bosnia and Herzegovina, The former Yugoslav Republic of Macedonia and Georgia. Armenia and Montenegro have also submitted data based on calculation of the three main GHGs, but emissions/removals through LULUCF are not provided.

62. Data on GHG emissions in CO_2 equivalent have been submitted by Belarus, Kyrgyzstan, Republic of Moldova, Serbia and Ukraine.

63. All above mentioned countries, except Belarus, Republic of Moldova and Ukraine, have also shown data on GHG emissions per capita and level of GDP.

64. Tajikistan, Turkmenistan and Uzbekistan have not submitted data for this indicator.

Format

65. All countries, which submitted the data, have measured the indicators in units according to the required data format. GHGs are either calculated in CO_2 equivalent using appropriate recalculation factors or submitted already as CO_2 equivalent.

Time series

66. Azerbaijan, Georgia, Kazakhstan, the Russian Federation have the most complete time series from 1990 until 2011-2012.

67. Montenegro has submitted data for the period of 1990-2010, Ukraine for 2004-2012, Bosnia and Herzegovina for 1990-2001, Belarus for 2005-2011, Armenia for 1990, 1995, 2000-2006, and Kyrgyzstan for 2000-2005. Serbia has submitted data for 2 years: 1990 and 1998.

68. Belarus, the Russian Federation and Ukraine are members listed in Annex 1 to the UNFCCC. These countries have undertaken special obligations of GHG emission limitation. Each country has prepared 5 national communications on climate change and some more communications are being prepared currently. Other countries, which are not included in Annex 1 to the UNFCCC, mainly are in the process of preparing their third national communication to the UNFCCC, which will include more recent data on GHGs.

E Biochemical oxygen demand and concentration of ammonium in rivers (C10)

69. This core indicator provides a measure of the state of rivers in terms of biodegradable organic load and ammonium (NH_4). The indicator is referred under the ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, and the Protocol of Water and Health under this Convention.

70. The analysis shows the production of data on average annual biochemical oxygen demand (BOD) in major rivers (sub-indicator 5.1) and ammonium concentration in the major rivers (sub-indicator 5.2).

1. Optimal level of indicator production

Structure

71. To reach the optimal level of production of the indicator C10, river water samples at least from three sampling points (unstream and downstream) need to be taken and analysed for the concentrations of BOD and ammonium.

72. The analysis considers only two parameters of indicator C10, in accordance with the requirements of the project on establishing a joint system of environmental indicators, in order to set up a regular process of reporting on those indicators. The full set of parameters is specified in the Indicator Guidelines (http://www.unece.org/env/indicators.html).

Format

73. To produce the indicator the following units of measurements are to be used:

(a) The annual average BOD after five days of incubation (BOD5) at 20 degrees Celsius is expressed in mg of O_2/litre.

(b) Average annual ammonium concentration, which is measured in mg/litre.

Time series

74. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Table 5

Production of indicator C10 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Fully met (1 river)	Fully met	1990; 1995; 2005-2012
Azerbaijan	Fully met (1 river)	Fully met	2005-2013
Belarus	Fully met (10 rivers)	Fully met	2005-2012
Bosnia and Herzegovina	No data		
Georgia	Fully met (1 river)	Fully met	1990; 1995; 2000-2012
Kazakhstan	Fully met (1 river)	Fully met	1990; 2000-2013
Kyrgyzstan	Fully met (1 river)	Fully met	2006-2011
Montenegro	Fully met (13 rivers)	Fully met	2009-2012
Republic of Moldova	Not met		
The Russian Federation	Fully met (5 rivers)	Fully met	2010-2012
Serbia	Fully met (4 rivers)	Fully met	1990; 1995; 2000-2012
Tajikistan	No data		
Former Yugoslav Republic of Macedonia	Fully met (3 rivers)	Fully met	2002-2012
Turkmenistan	No data		
Ukraine	No data		
Uzbekistan	No data		

Structure

75. The following countries have submitted data which fully meet the requirements of the Indicator Guidelines: Armenia (1 river), Azerbaijan (1 river), Belarus (10 rivers), Georgia (1 river), Kazakhstan (1 river), Kyrgyzstan (1 river), Montenegro (13 rivers), Serbia (4 rivers), The former Yugoslav Republic of Macedonia (4 rivers), the Russian Federation (5 rivers).

76. Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Montenegro, Serbia, The former Yugoslav Republic of Macedonia and the Russian Federation have shown the measurements of BOD5 and NH_4 concentrations at least from three stations.

77. Republic of Moldova has not submitted the times series data for this indicator; Tajikistan, Turkmenistan, Ukraine and Uzbekistan have not submitted data for this indicator.

78. Data, which have been submitted by Armenia, Azerbaijan, Georgia, have maximum, minimum and average concentrations in each of the three sampling points. Kazakhstan presented data on mean annual values in each sampling point.

79. Belarus and Kyrgyzstan have submitted averaged annual data of the indicator, the Russian Federation and The former Yugoslav Republic of Macedonia have provided average and maximum concentrations.

Format

80. All countries, which submitted the data, measure the indicators in units according to the required data format

Time series

81. Full data of average annual BOD5 and NH_4 concentrations in rivers for the period of 1990, 1995, 2000-2012 have been submitted by Georgia and Serbia, as well as by Kazakhstan (1990, 2000-2013).

82. The former Yugoslav Republic of Macedonia has submitted data of 2005-2013, Belarus for 2005-2012, Kyrgyzstan for 2006-2011, and Montenegro for 2009-2012.

83. The Russian Federation, which has submitted data for 2010-2012, publishes annual review of surface water quality in Russia, however, those reviews do not include long time data series.

F Nutrients in freshwater (C11)

84. This indicator determines the condition of water bodies by measuring nutrient concentrations in rivers, lakes, reservoirs, as well as in groundwater. The indicator is referred under the ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, and the Protocol of Water and Health under this Convention.

85. The analysis shows the average annual concentrations of (NO_3) in major water bodies (lakes, reservoirs) (sub-indicator 6.1) and the average annual total phosphorus (P_{total}) in major water bodies (lakes, reservoirs) (sub-indicator 6.2).

1. Optimal level of indicator production

Structure

86. In order to achieve the optimal production of the indicator C11, the following measurements are to be taken: water samples should be taken in major water bodies (lakes, reservoirs) and concentrations of NO_2 and P_{total} should be provided. In order to calculate the average concentration, data of all measurements taken should be used.

87. This analysis considers only two parameters of the indicator C11, in accordance with the requirements of the project on establishing a joint system of environmental indicators, in order to set up a regular process of reporting on those indicators. The full set of parameters is specified in the Indicator Guidelines (http://www.unece.org/env/indicators.html).

Format

88. The following units of measurements are to be used for this indicator:

(a) Concentrations of nitrates in fresh water samples (lakes, reservoirs) are measured in mg NO_3/litre;

(b) Concentrations of total phosphorus in fresh water samples (lakes, reservoirs) are measured in mg of P/litre.

Time series

89. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Table 6
Production of indicator C11 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Not met	Not met	
Azerbaijan	Not met	Not met	
Belarus	Partially met	Partially met	2005-2012
Bosnia and Herzegovina	No data		
Georgia	Not met	Not met	1990; 1995; 2000-2012 – nitrates, 2000-2012 - phosphate
Kazakhstan	Not met	Not met	1990; 2000-2012 – nitrates, 2009-2012 – total phosphorus
Kyrgyzstan	Not met	Not met	2005-2011
Montenegro	No data		
Republic of Moldova	Not met	Not met	
The Russian Federation	Partially met	Partially met	2010-2012
Serbia	Fully met	Fully met	1990; 1995; 2000 - 2012
Tajikistan	No data		

Country	*Structure*	*Format*	*Time series*
Former Yugoslav Republic of Macedonia	Fully met	Fully met	2001-2010 (total phosphorus); 2000-2006 (nitrates)
Turkmenistan	No data		
Ukraine	No data		
Uzbekistan	No data		

Structure

90. Serbia has submitted data on total phosphorus and nitrates concentration for one lake and one reservoir. The former Yugoslav Republic of Macedonia for two lakes.

91. Data from Belarus and the Russian Federation partially have such information: Belarus has shown data on the content of phosphate ion (in phosphorus equivalent) in 17 lakes. The Russian Federation has published reviews of the Russian surface water quality, showing nitrates concentration in a number of large reservoirs.

92. Georgia, Kazakhstan, and Kyrgyzstan have shown nutrient content not in lakes or reservoirs, but in rivers, and Armenia has provided data for nutrients in ground water. Azerbaijan and Republic of Moldova have not submitted time series data on this indicator.

93. Tajikistan, Turkmenistan, Ukraine and Uzbekistan have not submitted data for this indicator.

Format

94. Serbia and The former Yugoslav Republic of Macedonia have submitted their data in the required data format, specifying the sampling period and the number of samples taken.

95. Belarus and the Russian Federation, which partially submitted the data for this indicator, measure concentrations in units according to the required data format. Data from other countries do not include information of nitrates and total phosphorus concentration in major water bodies (lakes, reservoirs).

Time series

96. Serbia provided data for the period of 1990-2012, while The former Yugoslav Republic of Macedonia has submitted data on total phosphorus concentration for the period of 2001-2010, and nitrate content for 2000-2006. Belarus has shown measurements for 2005-2012.

97. The Russian Federation, which has submitted data for 2010-2012, publishes annual review of surface water quality, however, those reviews do not include long time data series.

G Protected areas (D1)

98. This core indicator is a response indicator, which shows the areas of land, water surfaces and adjacent air layer protected in compliance with the national legislation.

99. The analysis shows the total area of protected areas in a country in km^2 and as a percentage of the total country territory (sub-indicator 7.1).

1. Optimal level of indicator production

Structure

100. In order to reach the optimal production of indicator D1, data of the total protected areas in km^2 and as a percentage of the total country territory are necessary. Additionally, the indicator can be further broken down by the categories of natural territories which have a special World International Union for Conservation Union of Nature (IUCN) status, and for the national categories of protected areas to demonstrate their respective extent and share in the total area of the country.

Format

101. The indicator is calculated as the total area of the country's protected areas in hectares (ha) or km^2: total territory in hectares or km^2 and percentage of protected areas relative to the country's total area in categories, which are used on the national level, as well as in categories of IUCN.

Time series

102. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Table 7
Production of indicator D1 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Fully met	Fully met	1990; 1995; 2000-2012
Azerbaijan	Fully met	Fully met	1990; 1995; 2000- 2012
Belarus	Partially met	Fully met	2005-2012
Bosnia and Herzegovina	Fully met	Fully met	1990; 1995; 2000-2012
Georgia	Fully met	Fully met	1995; 2000-2012
Kazakhstan	Partially met	Fully met	2008-2012
Kyrgyzstan	Partially met	Fully met	No time series
Montenegro	Fully met	Fully met	1990-2012
Republic of Moldova	Partially met	Fully met	2012
The Russian Federation	Partially met	Fully met	1992-2012

Country	*Structure*	*Format*	*Time series*
Serbia	Fully met	Fully met	1990; 1995; 2000-2012
Tajikistan	No data		
Former Yugoslav Republic of Macedonia	Fully met	Fully met	1990; 1995; 2000-2012
Turkmenistan	No data		
Ukraine	No data		
Uzbekistan	No data		

Structure

103. Armenia, Azerbaijan, Bosnia and Herzegovina, Montenegro, Serbia, The former Yugoslav Republic of Macedonia and Georgia have submitted data which fully meet the requirements of the Indicator Guidelines. These countries' data have both total area of protected areas and their percentage relative to the country's total area. Besides, Georgia, Bosnia and Herzegovina, The former Yugoslav Republic of Macedonia and Serbia have submitted data in categories of protected areas of IUCN.

104. Belarus, Kyrgyzstan, Republic of Moldova, and the Russian Federation have shown the total area of protected areas, their quantity, as well as the area of each protected area. The Russian Federation has only shown the areas of protected areas on the federal level, and Kazakhstan has only shown information on the total area of all protected areas.

105. Tajikistan, Turkmenistan and Uzbekistan have not submitted data on this indicator.

Format

106. Serbia has submitted the data on the protected areas both in hectares and thousands of km^2. Armenia, Belarus, Kazakhstan, Kyrgyzstan, Montenegro, and the Russian Federation measure the protected areas in hectares. Azerbaijan, Bosnia and Herzegovina, The former Yugoslav Republic of Macedonia and Georgia use thousands of km^2 in measurement of the protected areas.

Time series

107. The following countries have full data on total area of protected areas for the period of 1990, 1995, 2000-2012: Armenia, Bosnia and Herzegovina, Montenegro, Serbia, The former Yugoslav Republic of Macedonia and Georgia. Azerbaijan provided data for the period of 1990 and 2000-2012.

108. The Russian Federation shows information for the period of 1992-2012, Belarus for 2005-2012, Armenia for 2007-2012, Kazakhstan for 2008-2012, and Republic of Moldova only for 2012.

109. Kyrgyzstan has not provided time series data for this indicator.

H Waste generation (I1)

110. This core indicator shows the total amount of all generated wastes in the country.

111. The analysis contains data on annual municipal waste generation per capita (sub-indicator 8.1).

1. Optimal level of indicator production

Structure

112. In order to reach the optimal production of indicator 11, the calculation should include the amount of waste, generated as municipal wastes per capita.

113. For the calculation of sub-indicator 8.1, also the following parameter has to be considered: population of the country.

114. This analysis considers only one parameter of the indicator 11, in accordance with the requirements of the project on establishing a joint system of environmental indicators, in order to set up a regular process of reporting on those indicators. The full set of parameters is specified in the Indicator Guidelines (http://www.unece.org/env/indicators.html).

Format

115. The parameter is to be provided in thousands of metric tons of generated municipal wastes; population is measured in millions of people.

Time series

116. Indicator data are to be provided for the period of 1990 (if applicable), 1995 (if applicable) and 2000-2012.

2. Analysis of indicator production in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia.

Table 8
Production of indicator 11 in the countries of South-Eastern and Eastern Europe, Caucasus and Central Asia

Country	*Structure*	*Format*	*Time series*
Armenia	Fully met	Fully met	1990; 1995; 2000-2012
Azerbaijan	Partially met	Fully met	2009-2012
Belarus	Partially met	Partially met	2005-2012
Bosnia and Herzegovina	Fully met	Fully met	2009-2012
Georgia	No data		
Kazakhstan	Fully met	Fully met	2005-2012
Kyrgyzstan	Fully met	Fully met	2005-2011
Montenegro	Fully met	Fully met	2009-2012
Republic of Moldova	Partially met	Partially met	2005-2009

Country	*Structure*	*Format*	*Time series*
The Russian Federation	Partially met	Partially met	2005-2012
Serbia	Fully met	Fully met	2006-2012
Tajikistan	No data		
Former Yugoslav Republic of Macedonia	Fully met	Fully met	2003-2012
Turkmenistan	No data		
Ukraine	Partially met	Partially met	1994-2012
Uzbekistan	No data		

Structure

117. Armenia, Bosnia and Herzegovina, Kazakhstan, Montenegro, Serbia, The former Yugoslav Republic of Macedonia and Kyrgyzstan have submitted data which fully meet the requirements of the Indicator Guidelines, including information of total and per capita municipal waste generation. The Republic of Moldova has data of municipal waste generation, but has not calculated the value per capita.

118. Belarus and the Russian Federation have shown only waste removal from households and other users, with the special purpose vehicles, to waste disposal places as municipal waste generation.

119. Azerbaijan's data have information of generation of all kinds of waste without singling out municipal waste, Ukrainian presents data only on total generated wastes.

120. Georgia, Tajikistan, Turkmenistan and Uzbekistan have not submitted the data for this indicator.

Format

121. All countries except for the Russian Federation, which submitted data on municipal waste generation, measure their quantity in accordance with the required data format (1000 tons/year).

122. Armenia, Azerbaijan, Bosnia and Herzegovina, Kazakhstan, Montenegro, Serbia, The former Yugoslav Republic of Macedonia and Kyrgyzstan show the data per capita in kg/capita.

123. The Russian Federation measures municipal waste removal to disposal places in thousands of m^3, what does not meet the requirement of the indicator format.

124. Kyrgyzstan measured the quantity of municipal wastes in thousands of m^3 until 2009. After that it started using 1000 tons/year as a unit of measurement, and data prior to 2009 have been recalculated.

125. Belarus, Republic of Moldova, and Ukraine have not calculated the amount of generated municipal wastes per capita in kg/capita.

Time series

126. Armenia has data of 1990, 1995, 2000-2012. Ukraine has shown 20 year time series of generation of all types of waste (without singling out municipal wastes). The former Yugoslav Republic of Macedonia has data for 2003-2012, Georgia, Kazakhstan and the Russian Federation for the period 2005-2012, Kyrgyzstan for 2005-2011, Serbia for 2006-2012, Republic of Moldova for 2005-2009, and Azerbaijan, Bosnia and Herzegovina, and Montenegro provided data for 2009-2012.

III. Online sharing of eight core indicators

127. The scope of an environmental indicator goes beyond the mere production of data. An indicator based on sufficient time series data can show key trends, help describe causes and effects of environmental conditions, allow comparison between countries, and make it possible to assess the efficiency of environmental policies.

128. To make these important tools directly and easily accessible to a broad range of users, including policy makers as well as the local and international public, it is essential that the responsible national authorities create and maintain websites to share their environmental indicators.

A Optimal levels of online sharing

129. For this review of sharing of the core indicators the online availability, content, and the languages of the websites to which links were submitted are analysed. The analysis is made against what is considered an optimal level of on-line presentation and sharing of the indicators, with reference, where relevant, to the principles set for the Shared Environmental Information System (SEIS).

130. Links that were provided by the countries referring to (real-time) databases, environmental reports or websites of international organizations and conventions have not been considered in this analysis. While it is highly encouraged to share all available environmental information, for this analysis only websites of national agencies presenting indicators including data, providing background information and describing trends in environmental conditions were reviewed (listed in Annex II).

1. Online availability

131. In an optimal case, each of the eight core indicators should be available on the website of an agency, which is given the responsibility to produce the indicator and to manage the data. This corresponds to the first SEIS principle stating that data should be managed as close as possible to a source of its production. Therefore, when countries have reporting obligations due to international treaties, the information should not only be published by the respective secretariats or conventions, but also on the websites of the national agencies responsible for reporting.

132. Moreover, the webpage with an indicator or set of indicators should be easily accessible from the main agency's website, through a menu bar or a dedicated icon.

133. In the analysis an indicator is rated as "easily accessible" if it is directly reachable via a clearly recognizable menu bar, a submenu, or an icon from the main page, and considered "not easily accessible" if the links to indicators on the main page are difficult to find, or access is only possible via a number of clicks. For reasons of clarity, the information should be preferably presented on one page per indicator or thematic area (e.g. water or air pollution) and in an interactive file format that permits easy navigation between

indicators or indicator content. The main agency's website should include a search function to facilitate the access to specific indicators requested by users.

2. Content

134. The website with an indicator/set of indicators should be presented in a clear and comprehensive way. It should provide clear and brief information on the content of the indicator presented (at least containing information on data structure and format, as well as on methodology) and a brief interpretation of the data.

135. To allow further access to more detailed background information, links on – at least – more detailed references to methodology, sources of data, and data validation procedures should be provided.

136. Moreover, the website should indicate when the content was changed.

3. Languages

137. The webpage(s) presenting the indicators should be available in local languages to be utilizable for the local public and policy makers and in a second language (English or Russian) so that it can be used by the international community and public of neighbouring countries.

138. Taken into account for the analysis of the available languages are the websites which contain information on the indicators, not the main pages of the relevant agencies.

B. Analysis of online sharing of indicators in South-Eastern and Eastern Europe, Caucasus and Central Asia countries

Table 9
Analysis of online sharing of indicators

Country	*Online availability*						*Content*			*Languages*		
	Number of indicators online on websites of national agencies	Accessibility from main page of national agencies	One webpage per indicator or thematic area	Indicators presented in interactive file format	Indicators presented as pdf	Search function available	Information on content provided on website	Links with further reading provided	Indication when content was changed	National language	Russian	English
Armenia	5	Easily accessible: 1/5 Not easily accessible: 4/5	Yes	1/5	4/5	Yes	Full information provided: 1/5 Incomplete information provided: 4/5	No links provided 5/5	No	5/5	0/5	5/5
Azerbaijan	5	Easily accessible : 5/5	Yes	0/5	5/5	Yes	Full information provided: 1/5 Incomplete information provided: 4/5	No links provided : 5/5	No	5/5	0/5	5/5
Belarus	8	Easily accessible : 8/8	No	3/8	5/8	Yes	Full information provided : 3/8 Incomplete information provided: 5/8	Links provided : 3/8 No links provided : 5/8	No	8/8	8/8	0/8
Bosnia and Herzegovina	4	Easily accessible: 1/4 Not easily accessible: 3/4	No	0/4	4/4	Yes	Full information provided : 4/4	Links provided : 4/4	No	4/4	0/4	3/4
Georgia	*No links provided*											
Kazakhstan	7	Easily accessible: 7/7	Yes	0/7	7/7	Yes	Full information provided : 6/7 Incomplete information provided: 1/7	No links provided : 7/7	No	7/7	7/7	0/7

Country	*Online availability*						*Content*			*Languages*		
Kyrgyzstan	7	Easily accessible : 7/7	No	0/7	7/7	Yes	Full information provided : 6/7 Incomplete information provided: 1/7	No links provided: 7/7	No	7/7	7/7	0/7
Montenegro	7	Not easily accessible: 7/7	No	0/7	7/7	Yes	Full information provided: 7/7	No links provided: 7/7	No	7/7	0/7	7/7
The Republic of Moldova	4	Easily accessible: 4/4	Yes	3/4	1/4	Yes	Full information provided: 1/4 Incomplete information provided : 3/4	Links provided: 1/4 No links provided: 3/4	No	4/4	0/4	4/4
Russian Federation	8	Easily accessible : 4/8 Not easily accessible : 4/8	No	0/8	8/8	Yes	Full information provided : 3/8 Incomplete information provided : 5/8	No links provided 8/8	No	8/8	8/8	0/8
Serbia	7	Easily accessible: 7/7	Yes	6/7	1/7	Yes	Full information provided: 6/7 Incomplete information provided : 1/7	Links provided: 5/7 No links provided: 2/7	No	6/7	0/7	2/7
Tajikistan	*No links provided*											
The former Yugoslav Republic of Macedonia	8	Easily accessible: 3/8 Not accessible: 5/8	Yes	0/8	8/8	Yes	Full information provided: 8/8	No links provided: 8/8	No	8/8	0/8	8/8
Turkmenistan	No links provided											
Ukraine	3	Easily accessible: 3/3	Yes	0/3	3/3	Yes	Incomplete information provided : 3/3	No links provided : 3/3	No	3/3	3/3	3/3
Uzbekistan	*No links provided*											

As a given country's indicators might be published on diverse websites with different patterns of online availability, content and languages, for each category of analysis it is stated for how many of the indicators published on national websites. For example, if a country publishes 6 indicators and 4 of them are available in English, the respective field states 4/6. For more information on the approach of the assessment and the rating please refer to section 3.1 (Optimal levels of online sharing). The links and the content on the respective pages were assessed in April 2014. It should be noted, that the websites might have been changed since the assessment.

1. Online availability

Number of online indicators on websites of national agencies

139. According to the provided information, Belarus, The former Yugoslav Republic of Macedonia and the Russian Federation share the information on all eight core indicators on national websites. Seven indicators are shared by Serbia (except "GHG emissions") and Montenegro (except "nutrients in freshwater"). Seven indicators in the required format are shared by Kazakhstan and Kyrgyzstan, five indicators by Armenia and Azerbaijan, four indicators by Bosnia and Herzegovina, and the Republic of Moldova, as well as three indicators by Ukraine. Georgia, Tajikistan, Turkmenistan and Uzbekistan have not provided information about indicators shared on national websites.

Accessibility from main page of national agencies

140. For Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Serbia, and Ukraine all shared indicators are easily accessible through the main webpages of the organizations responsible for the indicators' production, mainly through a menu bar entitled "Indicators" or "Environmental indicators".

141. In the case of The former Yugoslav Republic of Macedonia, information for three of the core indicators is easily accessible via a page providing an overview on the country's indicators, which is directly linked from the main page of the responsible ministry. However, this webpage still seems to be work in progress and references to the indicators in the thematic areas of climate change, air pollution and biodiversity are missing on this page. Therefore these indicators are rated as "not accessible".

142. In case of Bosnia and Herzegovina only the indicator A2 is easily accessible from the main page of the Federal Hydrometeorological Institute, while the documents covering the three other published indicators cannot be found from the main page of the Agency for Statistics, with its section on "Agriculture, environment and regional statistics" still being incomplete.

143. In a similar way, all indicators are not easily accessible in Armenia, as the data are in a common statistical database, which does not enable to assess a particular indicator (for instance, data on protected areas belong to the section "Forestry and hunting areas, protected areas").

144. In the Russian Federation it is not difficult to find four out of eight indicators ("emissions of poliutants into the atmospheric air", "consumption of ODS", "GHG emissions" and "protected areas"). At the same time it is difficult, with many clicks being necessary, to access the other four indicators of the Russian Federation ("ambient air quality in urban areas", "BOD5 and concentration of ammonium in rivers", "nutrients in freshwater", and "waste generation").

145. The seven indicators made available by Montenegro are not easily accessible online.

Presentation of indicators on individual webpages or by thematic area

146. Armenia, Azerbaijan, Kazakhstan, the Republic of Moldova, Serbia, and Ukraine share their indicators on individual websites.

147. Belarus presents all its indicators in a single document on a specially made webpage "Baseline indicators of the Joint Environmental Information System".

148. In the Russian Federation, some of the indicators ("emissions of pollutants into the atmospheric air", "ambient air quality in urban areas", "BOD5 and concentration of ammonium in rivers", "nutrients in freshwater" and "waste generation") are published on

individual websites. Some of the indicators can be found in the annually published State Report on the state of environment and environment protection.

149. In The former Yugoslav Republic of Macedonia the indicators are presented in thematic areas (e.g., water, air pollution, wastes).

150. Bosnia and Herzegovina, Kyrgyzstan and Montenegro presented all their indicators in single documents –reports on the state of the environment, which are published on the national websites of these countries.

Formats of indicator presentation

151. Serbia produces seven indicators. Six of them are interactively accessible and include maps and graphs. One more indicator ("waste generation") is presented in a PDF report. Belarus and the Republic of Moldova use an interactive format for three out of eight indicators and three out of four indicators respectively. Armenia presented five indicators (one of them is interactively accessible), while the other countries presented all indicators in PDF format.

Search function

152. All websites of the relevant agencies contain a search function.

2. Content

Information on content and links provided on websites

153. Montenegro and The former Yugoslav Republic of Macedonia provided nearly complete background information on all indicators on the respective webpages, including information about the data structure and format, as well as the methodology and a brief interpretation of data. Thus, Montenegro publishes the links to indicators of the European Environment Agency (EEA) and the links to detailed indicators description on the website of the national Environmental Protection Agency (EPA), which are not working yet. The former Yugoslav Republic of Macedonia provides no links to additional information.

154. Bosnia and Herzegovina provided brief background information for all its four indicators published online, including information on international policy targets and reporting obligations. It includes links in the documents, which mainly lead to international conventions and frameworks.

155. Background information is also available in Belarus, which includes evaluation criteria, methods of calculation, and schematic maps of monitoring sites for all eight indicators. At the same time, Belarus provided the information, which is close to fully meeting the requirements, only for three indicators ("ambient air quality in urban areas", "consumption of ODS", "BOD5 and concentration of ammonium in rivers").

156. Serbia publishes the information, including maps and graphs for six indicators. Links to detailed descriptions of the indicators by EEA (only in English) are provided for all five indicators on its indicator platform, while there are no links provided for the indicators "waste generation" and "protected areas".

157. Kazakhstan and Kyrgyzstan share a full range of the required data for six out of eight indicators. There is no or not complete data for two indicators: "nutrients in freshwater" and "protected areas". At the same time, the data of Kazakhstan published on the website of the Agency of statistics in MS Excel format do not contain any additional information. Kyrgyzstan's data are provided in tables, being part of the published national report on the state of environment. These data also do not contain any additional information and links to further reading.

158. All other countries published their own information on websites and presented only time-series of available data for some of the indicators. Furthermore, Armenia, Azerbaijan, the Russian Federation, Ukraine did not interpret the data. There are no links in this information to further reading.

159. The information on three out of eight indicators presented by the Russian Federation meet closely the requirement ("emissions of pollutants into the atmospheric air", "GHG emissions", "BOD5 and concentration of ammonium in rivers").

160. Georgia presented the data on required indicators in MS Excel format, without publishing them on the websites. Armenia and Azerbaijan partially published the information on websites. At the same time, they submitted quite complete information in MS Excel format which is not published on the websites. The analysis of the provided information indicates the presence of quite complete data on all indicators, except data on "nutrients in freshwater", in these countries.

161. The Republic of Moldova only provided background information and links within its report on GHG emissions, not providing any information on content nor links on its other websites being mere databases.

Indication of content changing period

162. On none of the websites a clear indication when content was updated can be found.

3. Languages

163. Ukraine publishes the information on indicators on websites in its national language, Russian and English. Armenia, Azerbaijan, Montenegro, the Republic of Moldova, and The former Yugoslav Republic of Macedonia publish all their indicators in national languages and in English. Serbia publishes six out of seven indicators in national language and two in English. Bosnia and Herzegovina published four indicators, three of them are available in both national language and English, while one indicator is only available in the national language.

164. Belarus and the Russian Federation presented the data only in Russian, which is the national language. Indicators by Kazakhstan and Kyrgyzstan are available only in Russian, which is the official language, along with the national languages in these countries.

165. The menu of websites of some countries (Belarus, The former Yugoslav Republic of Macedonia, Kazakhstan, Kyrgyzstan, Montenegro, the Russian Federation) have links to switch from national language to English. However this function does not seem to work yet, which makes environmental indicators inaccessible for international users.

IV. Conclusions

166. This analysis of the production and online sharing of the eight core ECE environmental indicators has pointed out achievements by many of the target countries but also areas in which further improvements are necessary.

167. With regard to the structure of produced indicators, the majority of the target countries provided all or most required parameters for the core indicators, while only a few countries could not provide the required parameters (i.e. the required sub-indicators and underpinning datasets) for a number of indicators. At the same time, many countries seem to have difficulties to produce the Indicator "Nutrients in freshwater" (C11).

168. Concerning the format it was found that the indicators are predominately submitted in unit of measurement required by the Indicator Guidelines. However, for a few countries the analysis finds inconsistencies with the requirements.

169. The national submissions were analysed on the time series produced, which should cover the years 1990, 1995, and 2000-2012. The analysis shows that for majority of cases a sufficient long time series of data are available. At the same time, it is worrisome that there are a considerable number of cases in which no data for the years 2011 and particularly 2012 are available.

170. With regard to the online sharing of indicators, it was found that a number of target countries do not share all indicators they produce on national websites yet. Especially the indicators "Consumption of ozone-depleting substances" (A3) and "Greenhouse gas emissions" (B3), for which data is published on websites of international conventions, in many cases seem not to be published on national websites. Nevertheless, it is clearly visible in the analysis that most countries strongly undertake efforts to increase the sharing of environmental information through the internet.

171. Furthermore, the majority of webpages presenting indicators are easily accessible from the respective national agency's main/home webpages, while some countries' indicators are hard to find, which might be the result of work-in-progress at the websites.

172. All but a few target countries publish their indicators on individual webpages (one indicator per page) or structured by thematic area.

173. The vast majority of the online indicators are presented in PDF format, while – so far – only some countries take the efforts to introduce a more interactive file format.

174. The analysis of the content of indicator webpages shows that some countries present basic background information on methodology as well as – in some cases – information on policy targets and a brief analysis of the data, while others present data without providing the necessary contextual information. A few countries also provide useful links referencing more detailed background information. Moreover, it was found, that none of the relevant webpages contain information on the time of the last update of content.

175. This analytical paper assessed also the languages in which information on indicators is published. It was found that all countries present their indicators on the webpages in the national or official language and a second language (Russian or English). At the same time, it points out, that the main/home webpages of some of the relevant agencies through which the indicators are to be accessed are not available in a second language, or the option to switch the language to e.g. English is not yet working.

176. As the aim to produce the eight core indicators according to the required structure and format is achieved or nearly achieved for the majority of the target countries analysed, a natural step to consider is to broaden the current scope to focus on the production on more than the current eight core indicators.

177. To this end, building on considerable achievements in the production of the eight core indicators, the expansion of the current scope can be done in two ways. On one hand, countries can broaden the scope of the eight core indicators by adding the remaining parameters to them. On the other hand, a set of additional indicators from the Indicator Guidelines complimentary to the current core indicators, if identified, could gradually be produced and shared by the target countries.

178. Finally, all indicators that are produced should be shared. The target countries need therefore to take all the necessary effort to do so.

179. A document (ECE/CEP-CES/GE.1/2014/4) with tailor-made recommendations for production and sharing of environmental indicators, based on the current analysis, was prepared to facilitate both the indicator production and sharing efforts.

Annex I: United Nations Economic Commission for Europe Core Environmental Indicators

Indicators from the Indicator Guidelines	*Sub-indicator*	*Dataset*
1. Emissions of pollutants into the atmospheric air (A1)	1.1. Emissions of sulphur dioxide per capita (1)	(1) Emissions of SO_2
	1.2. Emissions of sulphur dioxide per square kilometer (2)	
	1.3. Emissions of nitrogen oxides per capita (3)	(2) Emissions of NO_x
	1.4. Emissions of nitrogen oxides per square kilometer (4)	
2. Ambient air quality in urban areas (A2)	2.1. Annual mean concentration of nitrogen dioxide in the major city (5)	(3) Mean concentration of NO_2
3. Consumption of ozone-depleting substances (ODS) (A3)	3.1. Aggregated consumption of ODS (6)	(4) Consumption of ODS
4. Greenhouse gas (GHG) emissions (B3)	4.1 Emissions of carbon dioxide per capita (7)	(5) GHG emissions
	4.2. Emissions of carbon dioxide per unit of GDP (8)	
5. BOD5 and concentration of ammonium in rivers (C10)	5.1. BOD 5 concentration in the major rivers (3 sampling points – upstream, downstream, intermediate) (9)	(6) BOD5 concentration in the rivers
	5.2. Ammonium concentration in the major rivers (3 sampling points – upstream, downstream, intermediate) (10)	(7) Ammonium concentration in the rivers

Indicators from the Indicator Guidelines	*Sub-indicator*	*Dataset*
6. Nutrients in freshwater (C11)	6.1. Nitrates concentration in major water bodies (lakes, reservoirs) (11)	(8) Nitrates concentration in the major water bodies
	6.2. Total phosphorus concentration in major water bodies (lakes, reservoirs) (12)	(9) Total phosphorus concentration in the major water bodies
7. Protected areas (D1)	7.1. Share of total protected areas in the country area (13)	(10) Areas under protection in total and broken down by regimes of protection
8. Waste generation (I1)	8.1. Annual generation of municipal waste per capita (14)	(11) Annual municipal waste generation

Annex II: Overview of links to the national websites, provided by countries

Country	*Agency*	*Publications of multiple indicators/ overviews*	*1. Emissions of pollutants into the atmospheric air (A1)*	*2. Ambient air quality in urban areas (A2)*	*3. Consumption of ozone-depleting substances (ODS) (A3)*	*4. Greenhouse gas (GHG) emissions (B3)*	*5. BOD 5 and concentration of ammonium in rivers (C10)*	*6. Nutrients in freshwater (C11)*	*7. Protected areas (D1)*	*8. Waste generation (I1)*
Armenia	National Statistical Service of the Republic of Armenia		http://www.armstat.am/file/article/10.mtnolortayin_artanetumner.pdf * Nat En	http://www.armstat.am/file/article/14.bnap._monitoring.pdf * Nat En		http://armstatbank.am/Selection.aspx?rxid=002cc9e9-1bc8-4ae6-aaa3-40c0e377450a&px_db=ArmStatbank&px_type=PX&px_language=en&px_tableid=ArmStatbank%5c8+Environment+and+energy%5cEnvironment%5cGaz_artanetum-1.px	http://www.armstat.am/file/article/14.bnap._monitoring.pdf * Nat En		http://www.armstat.am/file/article/8_antartntesutyun.pdf * Nat En	http://www.armstat.am/file/article/12_tapon.pdf * Nat En
Azerbaijan	The State Statistical Committee of the Republic of Azerbaijan	http://www.stat.gov.az/source/environment/index.php Nat En	http://www.stat.gov.az/source/environment/indexen.php Nat En			http://www.stat.gov.az/source/environment/indexen.php Nat En			http://www.stat.gov.az/source/environment/indexen.php Nat En	
Belarus	National Statistical Committee of the Republic of Belarus	www.belstat.gov.by/homep/ru/indicators/envir.php Nat Ru								

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Bosnia and Herzegovina	Federal Hydrometeoro-logical Institute			http://www.fhmzbih.gov.ba/bilten/2013-bilten.pdf * Nat						
	Agency for Statistics				http://www.bhas.ba/tematskibilteni/Okolis%20bos%20-%20konacan%201.pdf * Nat En					http://www.bhas.ba/tematskibilteni/Okolis%20bos%20-%20konacan%201.pdf * Nat En
Georgia		*No links provided*								
Kazakhstan	Agency of statistics of the Republic of Kazakhstan	http://stat.gov.kz/faces/homePage/homeMethodologySubPage?_adf.ctrl-state=1b9xn8w6e2_29&_afrLoop=844396940227735&_afrWindowMode=0&_afrWindowId=1b9xn8w6e2_26 * Nat Ru								http://stat.gov.kz/faces/homePage/homeMethodologySubPage?_adf.ctrl-state=1b9xn8w6e2_29&_afrLoop=844396940227735&_afrWindowMode=0&_afrWindowId=1b9xn8w6e2_26 * Nat Ru
Kyrgyzstan	State Agency on Environment Protection and Forestry affiliated to the government of the Kyrgyz Republic	http://nature.kg/index.php?option=com_content&view=category&layout=blog&id=33&Itemid=70&lang=ru Nat Ru En								http://nature.kg/index.php?option=com_content&view=category&layout=blog&id=33&Itemid=70&lang=ru Ru
Montenegro	Environmental Protection Agency of Montenegro (EPA)	http://www.epa.org.me/index.php/component/content/article/87-azzs/388-izvjestaj-o-stanju-zivotne-sredine-na-bazi-indikatora * Nat En								http://www.epa.org.me/index.php/component/content/article/87-azzs/388-izvjestaj-o-stanju-zivotne-sredine-na-bazi-indikatora * Nat En

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	Statistical Office of Montenegro (MONSTAT)									http://www.monstat.org/eng/page.php?id=512&pageid=64 * Nat En
The Republic of Moldova	National Bureau of Statistics of the Republic of Moldova (NBS)	http://www.statistica.md/category.php?l=en&idc=99 * Nat Ru En	http://statbank.statistica.md/pxweb/Database/EN/01%20GEO/GEO03/GEO03.asp Nat En							http://statbank.statistica.md/pxweb/Database/EN/01%20GEO/GEO04/GEO04.asp Nat En
	Climate Change Office (CCO)					http://www.clima.md/doc.php?l=ro&idc=82&id=3471 * Nat En				
Russian Federation	Federal State Statistics Service		http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/environment/# Nat Ru							http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1138698314188 Nat Ru
	Ministry of Natural Resources and Environment of the Russian Federation		http://www.mnr.gov.ru/upload/iblock/cef/gosdoklad%20za%202012%20god.pdf * Nat Ru		http://www.mnr.gov.ru/upload/iblock/cef/gosdoklad%20za%202012%20god.pdf * Nat Ru				http://www.mnr.gov.ru/upload/iblock/cef/gosdoklad%20za%202012%20god.pdf * Nat Ru	

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	Main Geophysical Observatory named after A.I. Voeikova			http://www.voeikovmgo.ru/images/stories/publications/ejegodnik_zagr_atm_2011_color.pdf * Nat Ru						
	Federal service for Hydrometeorology and environmental monitoring						http://www.ghi.aaanet.ru/node/10 Nat Ru http://www.ghi.aaanet.ru/node/9 Nat Ru	http://www.ghi.aaanet.ru/node/10 Nat Ru http://www.ghi.aaanet.ru/node/9 Nat Ru		
Serbia	Environmental Protection Agency (SEPA)	http://indicator.sepa.gov.rs/ Nat http://www.ekoregistar.sepa.gov.rs/ Nat En	http://indicator.sepa.gov.rs/pretraga/indikatori/allfind/92bce6ebff2a41a2bbce8d97cdd5b73b Nat	http://indicator.sepa.gov.rs/pretrazivanje-indikatora/indikatorilat/allfindu/8bfea7520d994b9f9111d02afa3dbf7b Nat			http://indicator.sepa.gov.rs/pretraga/indikatori/allfind/14e3c0ae18d446609824725561d3dc8 Nat	http://indicator.sepa.gov.rs/pretrazivanje-indikatora/indikatorilat/allfind/73898ebbd52b436cbd06517c7892990a Nat		
	Statistical Office of the Republic of Serbia (SORS)									http://webrzs.stat.gov.rs/WebSite/repository/documents/00/00/61/97/Statistika_otpada.pdf * En

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	Serbian Biodiversity Portal (established by the Convention on Biodiversity)								http://biodiverzitet-chm.rs/information/indikatori-biodiverziteta Nat En	
Tajikistan	*No links provided*									
TfYR of Macedonia	Ministry of Environment and Physical Planning (MoEPP)	http://www.moepp.gov.mk/izzs	http://www.moepp.gov.mk/PDF/indikatoriEN/CSI%20vozduh%20EN%20-%202012%20.pdf * Nat En			http://www.moepp.gov.mk/PDF/indikatoriEN/CSI%20klimatski%20-%202012.pdf * Nat En	http://www.moepp.gov.mk/PDF/indikatoriEN/CSI%20voda%20EN%20-%202012.pdf * Nat En		http://www.moepp.gov.mk/PDF/indikatoriEN/CSI%20biodiverzitet%20EN%20-%202012.pdf * Nat En	http://www.moepp.gov.mk/PDF/indikatoriEN/CSI%20otpad%20EN%20-%202012.pdf * Nat En
Turkmenistan	*No links provided*									
Ukraine	State Statistic Service of Ukraine (SSC of Ukraine)	www.ukrstat.gov.ua Nat Ru En	www.ukrstat.gov.ua Nat Ru En			www.ukrstat.gov.ua Nat Ru En				www.ukrstat.gov.ua Nat Ru En
	State Environmental Investment Agency of Ukraine					http://www.sei a.gov.ua/seia/doccatalog/document?id=138881 * Nat				www.seia.gov.ua Nat
	The Ministry of regional development, building and									http://minregion.gov.ua/zhkh/Blahoustr-terytoriy/stan-

Country	*Agency*	*Publications of multiple indicators/ overviews*	*1. Emissions of pollutants into the atmospheric air (A1)*	*2. Ambient air quality in urban areas (A2)*	*3. Consumption of ozone-depleting substances (ODS) (A3)*	*4. Greenhouse gas (GHG) emissions (B3)*	*5. BOD 5 and concentration of ammonium in rivers (C10)*	*6. Nutrients in freshwater (C11)*	*7. Protected areas (D1)*	*8. Waste generation (I1)*
	housing and communal services of Ukraine									sfery-povodzhennja-z-pobutovymi-vidhodami-v-ukraini-za-2012-rik. * [sic]
Uzbekistan	*No links provided*									

Annex III: Principles of the Shared Environmental Information System

1. Information should be managed as close as possible to its source

2. Information should be collected once, and shared with others for many purposes

3. Information should be readily available to public authorities and enable them to easily fulfil their legal reporting obligations

4. Information should be readily accessible to end-users, primarily public authorities at all levels from local to European, to enable them to assess in a timely fashion the state of the environment and the effectiveness of their policies, and to design new policy

5. Information should also be accessible to enable end-users, both public authorities and citizens, to make comparisons at the appropriate geographical scale (e.g. countries, cities, catchments areas) and to participate meaningfully in the development and implementation of environmental policy

6. Information should be fully available to the general public, after due consideration of the appropriate level of aggregation and subject to appropriate confidentiality constraints, and at national level in the relevant national language(s)

7. Information sharing and processing should be supported through common, free open standards